# 9.0 DATA REDUCTION, VALIDATION, REPORTING, AND MANAGEMENT

## 9.1 DATA VALIDATION AND REPORTING BY DATA TYPE AND DATA MANAGEMENT

**9.1.0.1.** Data quality objectives are based on the project types and requirements, and shall be included in the project-specific work plans. Data validation requirements for screening and definitive data are summarized below.

- Screening data includes all data defined by *the Data Quality Objectives Process for Superfund Guidance* (U.S. EPA, 1993) as data gathered using methods that have limited QC or data validation requirements, or data collected using non-standard methods of sample collection (refer to Tables 3-2 and 3-6 of this QAPP). These data shall be reviewed by the Prime Contractor's Quality Assurance Officer (QAO) or designee to ensure that the procedures specified in the project-specific work plans and this QAPP were followed. These data shall be reported in a format that will facilitate their review. Screening data shall not be validated.

- Definitive data includes all data generated using standard methods of sample collection and analysis (as specified in Table 3-2 of this QAPP). Standard data packages as defined in Table 9-1 shall be provided with all definitive data. The data shall be reduced as appropriate to their intended use, and shall be reported in a format that will facilitate their review. All definitive data shall be validated.

## 9.2 FIELD DATA

### 9.2.1. Validation

**9.2.1.1.** Field data including data collected using field test kits (i.e., Hach, PCB, explosives, etc.) shall be presented in a format that shall facilitate data review and evaluation. A narrative shall be provided to describe any deviations from the procedures, explain any qualifications regarding the data quality, and discuss any significant problems encountered during field measurement. Tables, graphs, or figures shall be used to present the data. All field data shall be reviewed by the contractor's QAO to ensure that the procedures specified in this QAPP were followed; however, no formal data validation shall be performed. The data shall be reported as described in Table 9-1.

## 9.3 LABORATORY DATA

**9.3.0.1.** Laboratory data shall be reduced and validated by the Contract Laboratory as specified by the analytical methods, this QAPP and the Contract Laboratory's SOPs. Data reduction calculations are specific to the analytical instruments that are used for analysis, the level of automation, and the type of software used to reduce the data. The laboratory's SOPs shall be included in the project-specific work plans. Refer to Section 3.0 of this QAPP for equations that shall be used by the laboratory to assess precision, accuracy, and completeness. The following sections briefly describe data reduction and validation by the laboratory for both screening and definitive data.

### 9.3.1. Screening Data Reduction, Validation, and Reporting

**9.3.0.1.** The laboratory shall perform a 100 percent reduction and review of all screening data. Screening data are defined in Tables 3-2 and 3-6 of this QAPP. All screening data shall be qualified if critical calibration and QC requirements are not met. The calibration,

QC requirements, corrective action requirements are provided in Appendices A through H, and the flagging criteria required are described in Table 9-2. The flagging criteria shall be applied when acceptance criteria were not met and corrective action was not successful or not performed. The data reporting requirements are listed in Table 9-1.

### 9.3.2. Definitive Data Reduction, Validation, and Reporting

**9.3.2.1.** The laboratory shall perform a 100 percent reduction and review of all definitive data. The Contract Laboratory's review of the data shall include assessing QC data compliance with the control limits as specified in Appendices A through H and ensuring that all corrective actions were followed. The Contract Laboratory shall prepare and retain full analytical and QC documentation for a minimum of seven years.

**9.3.2.2.** The analytical data shall be reported in a format that will facilitate independent data validation as described in Section 12.0. All data shall be reported as specified in Table 9-1 of this QAPP and shall be qualified as specified in Table 9-2. Flagging criteria are applied to definitive data when acceptance criteria were not met and corrective action was not successful or not performed.

## 9.4 DATA MANAGEMENT

**9.4.0.1.** The individuals responsible for data management shall include all personnel responsible for identifying, reporting, and documenting activities affecting data quality. The qualifications of individuals associated with data management activities shall be commensurate with the level of expertise necessary to ensure the intended level of evaluation.

**9.4.0.2.** All project files shall provide a traceable record for all data management activities. The Contract Laboratory shall maintain a project file that includes but is not

limited to the following: formulas used, computer programs used, which data transfers are electronic or manual, validation steps, etc. All data acquired electronically shall be transferred and manipulated electronically to reduce errors inherent in manual data manipulation. Data entered, transferred, or calculated by hand shall be spot checked for accuracy by someone who did not perform the original entries or calculations.

## 9.5 DATA ARCHIVE

**9.5.0.1.** The Contract Laboratory shall maintain a project-specific file such that the analytical process can be completely reconstructed. The Contract Laboratory shall preserve all information regarding sample analyses (correspondence, sample custody forms, hard copies of raw data, results, calibration records, etc.) in the project file. Data storage and documentation shall be maintained in logbooks and on data sheets that shall be included in the project file. Computer-acquired data shall also be stored on magnetic tape, disks, or other media that can be accessed using industry-standard hardware and software for data processing, retrieval, or reporting. The Contract Laboratory shall maintain all data under this contract for a minimum of seven years following submission of the Certificate of Analysis (data package).

**9.5.0.2.** The Prime Contractor shall provide a hard copy of the analytical and field data and an electronic deliverable report to Hill AFB in the Environmental Restoration Program Information Management System (ERPIMS) format as specified by the project-specific statement of work. ERPIMS is a data management system designed to accommodate all types of data collected for IRP projects. Specific codes and data forms have been developed to allow consistent and efficient input of information to the system. The database information shall be provided by the Prime Contractor via ASCII files in specified ERPIMS format on 3.5” floppy diskettes or by direct electronic transfer. A detailed discussion of ERPIMS requirements are presented in Appendix J. The information transferred shall include all required technical data such as site

information; well characteristics; and hydrogeologic, geologic, physical, and chemical analysis results. Electronic data reporting formats and requirements included in the most current version of the *ERPIMS Data Loading Handbook, Version 4* (HQ AFCEE/MSC at Brooks Air Force Base, Texas 1998) shall be followed.

**9.5.0.3.** Hill AFB has developed and maintains its own graphic information system (GIS) database in which data are managed and stored. The QA/QC for this database follows the Air Force Center for Environmental Excellence ERPMIS Version 4.0 guidance and ERPTOOLS/PC 2.0. The criteria for data submissions to Hill AFB are based on this guidance and are defined in Appendix J of this Basewide QAPP.

**TABLE 9-1**

**DATA REPORTING REQUIREMENTS**

| Data Type | Sampling Methodology[a][b] | Data Description | Analysis Type | Data Reporting Requirements | Report Format |
|---|---|---|---|---|---|
| Screening Data: Soil or Sediment | Standard or Non-Standard | General soil chemistry data collected in the field using portable meters | —pH | —Location, date, and time sample collected<br>—Initial and continuing calibration data<br>—pH data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |
| | | | —Conductivity | —Location, date, and time sample collected<br>—Initial and continuing calibration data<br>—Conductivity data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |
| | | | —Temperature | —Location, date, and time sample collected<br>—Initial and continuing calibration data<br>—Temperature data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |
| Screening Data: Soil or Sediment | Standard or Non-Standard | General soil chemistry data generated by a laboratory | —pH | —Location, date, and time sample collected<br>—pH data | —Hard copy of data report<br>—Hard copy of data report |
| | | | —Temperature | —Location, date, and time sample collected<br>—Temperature data | —Hard copy of data report<br>—Hard copy of data report |
| | | | —Conductivity | —Location, date, and time sample collected<br>—Conductivity data | —Hard copy of data report<br>—Hard copy of data report |
| | | | —Total Organic Carbon | —Location, date, and time sample collected<br>—Percent moisture and TOC data | —Hard copy of data report<br>—Hard copy of data report |
| Screening Data: Ground-Water, Surface Water, Influent, or Effluent | Standard or Non-Standard | General water quality data collected in the field using portable meters | —pH | —Location, date, and time sample collected<br>—Initial and continuing calibration data<br>—pH data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |
| | | | —Specific conductivity | —Location, date, and time sample collected<br>—Initial and continuing calibration data<br>—SC data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |
| | | | —Temperature | —Location, date, and time sample collected<br>—Initial and continuing calibration data<br>—Temperature data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |

Acronyms are defined on the last page of this table.

**TABLE 9-1**

**DATA REPORTING REQUIREMENTS**
**(CONTINUED)**

| Data Type | Sampling Methodology[a][b] | Data Description | Analysis Type | Data Reporting Requirements | Report Format |
|---|---|---|---|---|---|
| Screening Data: Ground-Water, Surface Water, Influent, or Effluent, (con't) | Standard or Non-Standard | General water quality data collected in the field using portable meters | —Salinity | —Location, date, and time sample collected<br>—Initial and continuing calibration data<br>—Salinity data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |
| | | | —Reduction-oxidation potential (Eh) | —Location, date, and time sample collected<br>—Initial and continuing calibration data<br>—Eh data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |
| | | | —Dissolved oxygen | —Location, date, and time sample collected<br>—Initial and continuing calibration data<br>—Dissolved oxygen data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |
| Screening Data: Ground-Water, Surface Water, Influent, or Effluent | Standard or Non-Standard | General water quality data generated by a laboratory | —pH | —Location, date, and time sample collected<br>—pH data | —Hard copy of data report<br>—Hard and electronic[d] copy of data report |
| | | | —Total dissolved solids | —Location, date, and time sample collected<br>—TDS data | —Hard copy of data report<br>—Hard and electronic[d] copy of data report |
| | | | —Total Organic Carbon | —Location, date, and time sample collected<br>—TOC data | —Hard and electronic[d] copy of data report<br>—Hard and electronic[d] copy of data report |
| | | | —Alkalinity | —Location, date, and time sample collected<br>—Alkalinity data | —Hard copy of data report<br>—Hard and electronic[d] copy of data report |
| | | | —Total suspended solids | —Location, date, and time sample collected<br>—Total suspended solids data | —Hard copy of data report<br>—Hard and electronic[d] copy of data report |
| Screening Data: All media, except air or gas for headspace analysis | Standard or Non-Standard | Headspace analysis for volatile hydrocarbons using field meters (organic vapor meter or field gas chromatograph [GC]) | —Total volatile hydrocarbons (organic vapor meter) | —Location, date, and time sample collected<br>—Meter calibration information<br>—Total volatile hydrocarbon data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |
| | | | —Target volatile hydrocarbons (field GC) | —Location, date, and time sample collected<br>—Initial and continuing calibration data<br>—Method blank data<br>—Target analyte data<br>—Dilution factor (as applicable)<br>—Chromatograms | —Hard copy of data report<br>—Hard copy of data report<br>—Hard copy of data report<br>—Hard copy of data report<br>—Hard copy of data report<br>—Hard copy of data report |

Acronyms are defined on the last page of this table.

**TABLE 9-1**

**DATA REPORTING REQUIREMENTS**
**(CONTINUED)**

| Data Type | Sampling Methodology[a][b] | Data Description | Analysis Type | Data Reporting Requirements | Report Format |
|---|---|---|---|---|---|
| Screening Data: All media types except air or gas | Standard or Non-Standard | Inorganic or organic data collected in the field using test kits (e.g., Hach or immunoassay kits), or instruments (XRF) | —Cations (Hach), Anions (Hach), or Metals (XRF or Hach kit) | —Location, date, and time sample collected<br>—Standard or calibration data (as appropriate)<br>—Method blank data<br>—Target analyte data<br>—Duplicate or replicate sample data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |
| Screening Data: All media types except air or gas | Standard or Non-Standard | Inorganic or organic data collected in the field using test kits (e.g., Hach or immunoassay kits), or instruments (XRF) | —Immunoassay: Polychlorinated biphenyls, Pesticides, BTEX, Polynuclear aromatic hydrocarbons, Trinitrotoluene, Pentachlorophenol, etc. | —Location, date, and time sample collected<br>—Standard data (as appropriate)<br>—Method blank data<br>—Target analyte data<br>—Duplicate or replicate sample data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |
| Screening Data: All media types except air or gas | Standard or Non-Standard | Biological data generated by a laboratory | —Biological oxygen demand, heterotrophic plate count, and chemical oxygen demand | —Location, date, and time sample collected<br>—Initial and continuing calibration data<br>—Method blank data<br>—Target analyte data<br>—Dilution factor (as applicable)<br>—Matrix duplicate data<br>—Field duplicate or replicate sample data | —Hard copy of data report<br>—Hard copy of data report<br>—Hard copy of data report<br>—Hard copy of data report<br>—Hard copy of data report<br>—Hard copy of data report<br>—Hard copy of data report |
| Screening Data: All media types except air or gas | Non-Standard | Inorganic or organic data generated by a laboratory | —Standard methods of analysis[c] for organic or inorganic compounds | —Case narrative (including samples not meeting QC criteria, out of control conditions, corrective actions, and matrix effects with justification)<br>—Completed chain-of-custody (COC) forms<br>—Target compound results, including dilution factors for all samples<br>—Sample extraction/preparation and analysis dates<br>—Surrogate recoveries (organic compounds only)<br>—Method blank results | —Hard copy of data report<br>—Hard copy of data report<br>—Hard and electronic[d] copy of data report<br>—Hard and electronic[d] copy of data report<br>—Hard and electronic[d] copy of data report<br>—Hard and electronic[d] copy of data report |
| Screening Data: Air, Treatment Off-Gas, Soil Gas, Landfill Gas | Standard or Non-Standard | Data collected in the field using portable meters ($CO_2$ and $O_2$ meters or organic vapor meters) | —Carbon dioxide | —Location, date, and time sample collected<br>—Calibration data<br>—Carbon dioxide data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |
| | | | —Oxygen | —Location, date, and time sample collected<br>—Calibration data<br>—Oxygen data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |

Acronyms are defined on the last page of this table.

**TABLE 9-1**

**DATA REPORTING REQUIREMENTS**
**(CONTINUED)**

| Data Type | Sampling Methodology[a][b] | Data Description | Analysis Type | Data Reporting Requirements | Report Format |
|---|---|---|---|---|---|
| Screening Data: Air, Treatment Off-Gas, Soil Gas, Landfill Gas (con't) | | | —Volatile hydrocarbons | —Location, date, and time sample collected<br>—Calibration or standardization data (as appropriate)<br>—Dilution factor (as appropriate)<br>—Total volatile hydrocarbon data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |
| Screening Data: Air, Treatment Off-Gas, Soil Gas, Landfill Gas | Standard or Non-Standard | Volatile hydrocarbon data collected using field meters (organic vapor meter or field GC) | —Total volatile hydrocarbons (organic vapor meter) | —Location, date, and time sample collected<br>—Meter calibration information<br>—Total volatile hydrocarbon data | —Project-specific field form or log book<br>—Project-specific field form or log book<br>—Project-specific field form or log book |
| | | | —Target volatile hydrocarbons (field GC) | —Location, date, and time sample collected<br>—Initial and continuing calibration data<br>—Method blank data<br>—Target analyte data<br>—Dilution factor (as applicable) | —Hard copy of data report<br>—Hard copy of data report<br>—Hard copy of data report<br>—Hard copy of data report<br>—Hard copy of data report |
| Definitive Data: All media | Standard | Inorganic or organic soils data generated by a laboratory | —Standard methods of analysis[c] for organic or inorganic compounds | —Case narrative (including samples not meeting QC criteria, out of control conditions, corrective actions, and matrix effects with justification) | —Hard copy of data report |
| | | | | —Completed COC forms (COC form and internal tracking documents) | —Hard copy of data report |
| | | | | —Initial calibration summary form | —Hard copy of data report |
| | | | | —Continuing calibration summary form | —Hard copy of data report |
| | | | | —Internal standard area and RT summary (if applicable) | —Hard copy of data report |
| | | | | —Injection logs | —Hard copy of data report |
| | | | | —Target compound results for all samples, including field QC samples and dilution factors, reanalysis, batching information, and bracketing information | —Hard and electronic[d] copy of data report |
| | | | | —Method blank results | —Hard and electronic[d] copy of data report |
| | | | | —MS/MSD results (spike concentration, actual values, and percent recovery) | —Hard and electronic[d] copy of data report |
| | | | | —LCS results (spike concentration, actual values, and percent recovery) | —Hard and electronic[d] copy of data report |
| | | | | —Surrogate results, organic analysis (spike concentration, actual values, and percent recovery) | —Hard and electronic[d] copy of data report |
| | | | | —Raw data for all samples where matrix interference is invoked as the reason for MS/MSD, surrogate spike, or internal standard failure | —Hard copy of data report |
| | | | | —Holding time summary | —Hard and electronic[d] copy of data report |

Acronyms are defined on the last page of this table.

**TABLE 9-1**

**DATA REPORTING REQUIREMENTS**
**(CONTINUED)**

| Data Type | Sampling Methodology[a][b] | Data Description | Analysis Type | Data Reporting Requirements | Report Format |
|---|---|---|---|---|---|
| Definitive Data: All media (con't) | | | | —Initial and continuing check blanks (ICP, AA)<br>—Interference check solution (ICP) | —Hard and electronic[d] copy of data report<br>—Hard and electronic[d] copy of data report |
| Screening: Soil Physical Characteristic Data | Non-Standard | Geotechnical data collected in the field (CPT or particle size distribution, porosity, density, etc.) or data generated by a laboratory | —Field data (CPT or particle size distribution, porosity, density, etc.) | —Location, date, and time sample collected<br>—Calibration information (if appropriate) | —Project-specific field form, log book, or electronic file<br>—Project-specific field form, log book, or electronic file |
| | | | | —Test results | —Hard copy of data report |
| | | | —ASTM standard methods of analysis | —Location, date, and time sample collected<br>—Calibration information (if appropriate)<br>—Test results | —Hard copy of data report<br>—Hard copy of data report<br>—Hard copy of data report |
| Definitive-I: Soil Physical Characteristics Data | Standard | Geotechnical data generated by a laboratory | —ASTM standard methods of analysis | —Location, date, and time sample collected<br>—Calibration information (if appropriate)<br>—Test results | —Hard copy of data report<br>—Hard copy of data report<br>—Hard copy of data report |

(a) Non-standard sampling methodology includes those methods not defined in applicable and available guidance as described below, includes sampling techniques such as Hydropunch™ or Geoprobe™

(b) Standard Sampling Methodology:
RCRA Ground-Water Monitoring Draft Technical Guidance (U.S. EPA, 1992); RCRA Ground-Water Monitoring
Technical Enforcement Guidance Document (U.S. EPA, 1986a OSWER-9950.)
American Society of Testing and Materials Standards
Suggested Practices for the Design and Installation of Ground-Water Monitoring Wells (EPA/600/4-89/034, March 1991)
Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (U.S. EPA, Office of Emergency and Remedial Response EPA 500/540/G-89/004)
Guidance for Conducting Treatability Studies under CERCLA, Final (U.S. EPA, EPA/540/R-92/071A November 1992)
Soil Sampling Quality Assurance User's Guide (Environmental Monitoring Systems laboratory. Las Vegas, NV EPA/600/8-89/046)
Representative Sampling Guidance Vol. 1, Soil. (U.S. EPA, 1991OSWER Directive 9360.4-10)

**TABLE 9-1**

**DATA REPORTING REQUIREMENTS**
**(CONTINUED)**

(c) Standard Methods of Analysis:

EPA Test Methods for Evaluating Solid Waste Physical/Chemical Methods (SW-846), (U.S. EPA Third edition, September 1986; Final Update I, July 1992; Final Update IIA, August 1993; Final Update II, September 1994; Final Update IIB, January 1995; Final Update III, December 1996)

EPA 100-400 Series - Methods for the Determination of Inorganic Substances in Environmental Samples (EPA/600R-93/100, August 1993)

EPA 200 Series - Methods for the Determination of Metals in Environmental Samples, (EPA/600/4-91-010, June 1991; Supplement I, EPA/600/R-94/111, May 1994)

EPA 600 Series - Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater (U.S. EPA, CFR Title 40, Part 136, Appendix A, July 1996)

Compendium of Methods for Determination of Toxic Organic Compounds in Ambient Air (EPA/600/4-89/017, June 1988)

State of California Department of Health Services Determination of Perchlorate by Ion Chromatography (Rev. No. 0 June 1997)

(d) Requirement for electronic deliverables is project-specific

| | | | | | |
|---|---|---|---|---|---|
| QC | Quality Control | MS/MSD | Matrix Spike/Matrix Spike Duplicate | LCS | Laboratory Control Sample |
| CPT | Cone Penetrometer Test | ASTM | American Society for Testing and Materials | RT | Retention time |
| COC | Chain-of-Custody | ICP | Inductively Coupled Plasma | AA | Atomic Absorption |

**TABLE 9-2**

**LABORATORY DATA QUALIFIERS**

| Qualifier | Description |
|---|---|
| **F** | The analyte was positively identified, but the associated numerical value is below the practical quantitation limit and above the method detection limit; represents an estimated value. |
| **U** | Analyte is not detected. |
| **B** | The analyte was positively detected in a sample and in an associated blank. |
| **E** | Reported concentration is estimated; exceeds the linear calibration range of the instrument. |
| **R** | The data are unusable due to deficiencies in the ability to analyze the sample and meet QC criteria. |
| **D** | Indicates that the concentration was calculated using a secondary dilution factor (i.e., the result is calculated from the analysis performed by diluting the sample). |
| **T** | Tentatively identified compound (using Gas Chromatography/Mass Spectroscopy). |
| **M** | Reporting limit elevated due to matrix interference. |